HEART AND CIRCULATION IN THE FEEBLE-MINDED.[1]

A CLINICAL AND STATISTICAL STUDY.

By John Madison Taylor, A.M., M.D.,
AND
F. Savary Pearce, M.D.,
OF PHILADELPHIA.

The writers desire to present in this contribution the results of observations made at the Pennsylvania School for Feeble-minded Children at Elwyn, Pa. Studies were begun also at the schools at Vineland and at Haddonfield, New Jersey, but only the data from the first institution are embodied in this paper. They will be completed as opportunity shall permit, the research occupying so much time to complete that this is only a partial presentation of their work. It is not feasible to carry out parallel investigations as to the collateral factors—blood, peculiarities of innervation, secretions, etc.—necessary to a full understanding of these complicated states until the equipment of the schools shall afford larger opportunities for thoroughness.

Of literature on the subject there is little to be found.

The attention of one of us was directed some years ago to several cases of imbecility wherein the cardiac and circulatory disabilities were pronounced and seemed to bear causal relationship to the mental impairment. In some of these treatment of the defects was followed by marked improvement, and even now we have six cases under continued observation. It would be an obvious inference that if attention were given to the vascular defects in the earlier years of life this improvement would have been greater. A further plain generalization is that those cases of backward mentality, the product of developmental interference, could be mitigated by securing more nearly normal cerebral circulation and the maintenance of a blood-supply adequately freed from ptomaïnes and other intoxications. The lowered vitality of many of these individuals is shown in primary faults of development in many parts of the central nervous system followed by gastro-intestinal and other organic disorders, and as a sequel to these the blood and the other tissues suffer. This is most conspicuous in the lower types of so-called idiots. This subject has received very moderate attention. We have done a little in that direction. We are at this time especially attracted by those of the so-called imbecile class or backward-minded individuals in whom a fair degree of amelioration can be expected, and we hope yet to secure some practical results by treatment directed toward the vascular system and its innervation. For the idiot little can be expected from any treatment other than educational and hygienic.

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The nervous system of the young child suffers from the effects of toxins in many ways not yet understood. It is possible that the foundation of much disease, especially that affecting the brain, is laid long before we are capable of suspecting or detecting its presence, and through the agency of insidious and unknown toxic agents. It is also a fair inference that much of this damage is expended in large measure upon the structures of the circulatory apparatus, through and by which the organs of elaboration and elimination are maintained in a condition of vigor and integrity. If we could control the activity of the vasomotor system alone much could be accomplished. Acute delirium, maniacal states, the rapidly developed melancholias—in short, the alternation of exalted or depressed states—may be taken as an expression of a cytolysis of the cerebral neurones. Again, it is reasonable to infer that the peculiarities of the mental phenomena depend in some measure upon the degree of cell-alteration as well as upon the character of the circulatory poison, also upon the number, condition, and situation of the neurones involved in the process.

Acute poisoning from the gastro-intestinal tract is known to precipitate infantile convulsions. If continued and repeated this may develop into epilepsy, and the irritated cortical neurones thus suffer more or less permanent damage. A mild form of toxæmia may produce vertigo and other pronounced but evanescent discomforts or disabilities.[1] Again, the autotoxæmias due to the suppression or disturbance of the functions of an organ, as seen in myxœdema, cachexia strumipriva, and those states due to the overproduction of the normal and the evolution of abnormal products of the organism, as in the condition wherein hydrogen sulphide is retained in the blood, exophthalmic goitre, acetonuria, etc., all can be said to bear close relationship to circulatory incompetence. So, indeed, but to a less conspicuous degree, as in the other two subdivisions of Albu, auto-intoxicants occur from anomalies in the general metabolism without localization, as in gout and oxaluria, and those due to the retention of the physiological products of metabolism, such as uræmia and the effects of imperfect oxidation, etc.

In a study made by Dr. Charles A. Oliver and Dr. A. W. Wilmarth, in 1891, it was shown that among the Mongolian forms of idiocy the general pathological condition bore close causal relation to imperfect development of the entire vascular system, with consequent disease of the structures all tending toward early fatalities. These individuals had club-shaped, cold, clammy extremities, necessitating extra clothing and exceptionally heated apartments. On them mere scratches became ulcerous, and these ulcers failed to heal until warm weather returned. Ecchymoses were frequent and prevalent during any form of sickness, and they generally succumbed during the colder months of the year, with gross hemorrhagic or exudative lesions in the mucous tracts and other vital areas. The common etiological factor was great activity and a final overthrow of the nutritive centres during the earlier portion of the antenatal existence.

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[1] See article by one of us, Sajons' Annual, vol. vi., "Convulsions."

The subsequent part of this study consists of tabulated records of the 72 cases studied in the total number of 955 inmates examined: Males, 40; females, 32.

All cases were considered and only those recorded in whom there was any suspicion of lesion.

The cases were taken from among the higher-grade children chiefly, since it is in these we may hope to find transition epiphenomena of cardiovascular sort worthy of place in practical interpretaton, and for whatever of help may come toward evolution through mechanical and chemical agents.

The percentage of boys admitted to the institution is about three to one compared with girls, probably on account of the fact that girls can be better shielded at home. Boys are 60 per cent. and girls are 40 per cent. of the total number. Boys are, as a rule, brighter mentally and stronger physically.

As detailed in our "Preliminary Report of the Heart and Circulation in the Feeble-minded,"[1] the writers have pretty conclusively in the present work arrived at a confirmation of the hypotheses recorded in that paper, and feel more than ever impressed with the great importance of the subject under consideration. From tabulation of the examination of the 72 cases carefully studied we find the following:

MALES Average age of the males (eight to twenty-two years) twelve years. Of these 14 were of low grade; 14 of middle grade, and 12 of high-grade imbeciles.

Heart. We found no notable transposition of this or other organs in the number. In 20 cases the heart was somewhat hypertrophied, in 1 greatly so; this is an athletic, medium-grade imbecile. In 2 the heart was undersized. In 4 cases the heart was lower by one rib than its natural position (without hypertrophy). The cardiac pulsation was feeble in 25 cases. An hypertrophied heart in the feeble-minded does not as a rule present the increased pulse tension found in those of normal intellection.

Bradycardia (50 beats per minute or lower) existed in 3 cases; in these there was no other discoverable lesion, so that we conclude it to be perhaps an expression of central vagi irritation. The cardiac impulse was very feeble in 12 cases, and the impulse in addition very diffuse in 10 cases; all this without gross evidence of lesion in the cardiovascular system. Thus there would seem to be a disproportionate correlation between the detectable organic lesions in the feeble-minded and the signs presenting; in other words, the central neuronic degeneration through deficient innervation may disturb circulation as does the organic disorder *per se* of the circulatory apparatus. At the same time the contention is made that organic diseases of the heart and bloodvessels do occur much more frequently among these defectives than in people of normal brain development. Thus careful observation and treatment of the defect will undoubtedly assist both physical and mental development of the imbecile. Irregularity of the pulse was noted in 5 instances among males where cardiac lesions coexisted.

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[1] Journal of the American Medical Association, November 5, 1898.

Murmurs. There was no murmur among the males that obeyed the law of the so-called functional murmurs. Of organic murmurs there were six presystolic mitral and ten systolic mitral murmurs. There was one aortic systolic murmur and one double mitral murmur. Seventy-five per cent. of the heart sounds were the so-called valvular sounds, the muscular element being feeble or ataxic. The second aortic accentuation was not quite so frequent as mitral valvular sounds—as though the relation of the co-ordination of lungs and heart was proportionately more at fault than between the heart and systemic circulation. In one case the second sound could be detected only at the pulmonary cartilage, and in most cases this element of the second sound was also markedly accentuated.

Other special characteristics of heart-beat worthy of note were instances of marked arrhythmia in only three cases. Reduplication of the second sound was heard twice at the pulmonary area. In one case there was a patulous foramen ovale found subsequently at autopsy without physical signs to account for it during life.

Dr. Ales Hrdlika, in the *Twenty-fourth Annual Report of the Middletown, N. Y., State Hospital for the Insane*, gives the following figures as to heart disease in the insane:

Examined 1000 patients; found:	Males.	Females.
Organic heart disease . .	10.6 per cent.	11.6 per cent.
Functional derangement .	15.4 "	8.0 "
Of which there were noted:		
Simple hypertrophy . .	5.0 per cent.	4.2 per cent.
" dilatation . . .	1.0 "	1.8 "
Mitral insufficiency . .	2.4 "	4.2 "
Aortic " . .	2.0 "	0.6 "
Tricuspid " . . .	0.2 "	0.8 "
Heart very excitable . .	6.4 "	4.4 "
" " feeble . . .	7.2 "	2.8 "
" " irregular . .	1.8 "	0.8 "

Thrills. A thrill was felt at the apex but twice, but, as noted in six instances, there were presystolic murmurs, as though the muscular force of the cardiac action was greatly weakened, which we contend is a constant phenomenon, just as the general musculature is enfeebled in these defectives. Exception to this is in those rarer instances of moral perversion whose relatively greater physical strength accompanying a smaller than normal brain capacity (thus without proper inhibition) obtains as a potent cause for aggravating the psychological imbalance already existing. Indeed, were bodily vigor *less* in these cases we might hope for diminished moral perversion.

Pulse and Circulation. Irregularity of the radial pulse was found in seven instances (17 per cent.), which is evidence that there is greater ataxia of the vascular system than in the heart itself. Studies of the effects of such drugs as digitalis as favorably affecting these cases in the feeble-minded are important, just as more careful observations of cardiac conditions in general practice yield better results in treatment. That peculiarities of the sympathetic innervation will become a fruitful field of research among the imbecile and the insane we feel certain.

The pulse-rate was over 100 in sixteen cases (40 per cent.). This cannot be certainly reported, since the exciting conditions of an examination may increase the rate of the heart beats. In thirty-five of these cases there was the clammy skin and cold, bluish extremities which warrants the conclusion that the neurovascular system was much out of proper equilibrium. In the central nervous system of imbeciles the cerebro-spinal and vasomotor nervous mechanisms lack development and balance. The pulse tension seemed increased in but two instances, excepting in two others where the left carotid pulse was comparatively stronger, and the right radial pulse was comparatively increased in tension as compared with the pulse of the opposite side.

In one case of an epileptic adult male imbecile Addison's disease was pretty positively present. It may have been only an expression of tuberculosis of the suprarenal bodies boding a more general tubercular infection, which is the cause of death so frequently at the antipodes of the race (of the imbecile and insane and of the physically weak of a high order of intellection). The *reflexes* were generally increased in the males.

FEMALES. The average age of the thirty-two females studied was twelve years. Of these eight were low grade, fifteen medium grade, and nine were high grade imbeciles. There was no instance of transposition of the heart or other organs among them. The heart was distinctly hypertrophied in six instances, was displaced down one rib in two instances, very evidently dilated in one instance, and was undersized, as shown by percussion, in three cases. In twenty-six cases the cardiac impulse was feeble, and in one instance the "impact" on inspection and palpation was very diffuse. In this instance there was a very perceptible thrill, although a murmur could not be heard. It is the opinion of one of us that the thrill which can be felt readily with the palpating hand and yet not accompanied by audible sign (a murmur) is indicative of enfeebled myocardium rather than a vibration due to hæmatic or to valvular disease, so that in the imbecile of low type tissues generally we may expect more constantly to elicit this valuable diagnostic sign (the thrill) than in organic heart disease in individuals otherwise normal.

Murmurs. There were no functional murmurs heard among the females. This dearth of so-called functional murmurs in subjects otherwise giving audible signs of cardiac disease upholds the views of Jacobi that fewer and fewer murmurs can (if any at all) be designated as functional.

Of organic murmurs the presystolic mitral without thrill predominates. There were five such (16 per cent.) in the cases examined. There was one aortic systolic murmur accompanied by a thrill in a subject of fairly good physique and cardiac action. In two instances there was mitral regurgitation. In such cases compensation is better maintained than is true of other instances of valvular disease.

It is a singular fact that œdema is not often encountered among imbeciles with even marked evidences of cardiovascular disorder. Studies of the blood component by the physiological chemists may yet be fruitful in explanations of this, and may also throw some light upon feeding and on excretion of metabolites—a subject which appears to the writers important in the line of preventive and, indeed, in curative medication.

Irregularity of pulse-beat out of harmony with heart rhythm was again demonstrated as among the males, as stated under the proper heading. It occurred in 15 of the 32 cases (50 per cent.). Bradycardia existed in but three instances, and again where no demonstrable valve lesion was present. In over half (twenty) of the cases the radial pulses were rhythmic, but the alternating force of the pulse-beat was a notable sign of the prevailing status of vasomotor ataxia. Twenty-one cases were subject to rapid, feeble heart action—*i. e.*, over 110 per minute. In twenty-five the surfaces of the extremities were cold, bluish, or clammy.

The females seemed of lower tone physically than were the males examined.

The figures of Dr. Hrdlika in the report previously referred to show "out of five female imbeciles no one presents a cardiac derangement; out of fourteen males with the same trouble we find 21.5 per cent. of organic and 7 per cent. of functional troubles."

This author had only nineteen cases at his command to study, and yet the proportion of imbeciles in the males studied presented organic heart trouble in 21.5 per cent. and functional disturbances in 7 per cent.

CONCLUSIONS. In a detailed study of the circulation of seventy-two cases of feeble-minded children at the Elwyn School the writers have found a great number of varied cardiovascular signs, and these out of proportion to the mental defect—so much so as to warrant assuming organic vascular heart disease to be a large etiological factor in continuing the downward course of imbeciles. The plea is urged for careful anthropometric studies and for observations in detail of somatic disease other than that of the nervous system in cases of mental enfeeblement. They are also impressed in this study by the fact that many of the high-grade cases can be bettered much more by attention being paid to therapeusis of the cardiovascular disorders of imbeciles, also of the insane. The scientific laboratory studies of the blood and excretions will also in the future furnish valuable data, no doubt, in this direction, admitting the large rôle which biochemical products must play in the pathology of many diseases.

The action of certain alkaloids upon the peripheral circulation needs careful study and experiment.

The proper use of especially directed regulated movements (and imbeciles are notably good and willing imitators) will greatly help these afflicted beings. In uplifting the physique to however slight a degree the mentality will be improved.

We would urge also that overexercise of backward children is to be strenuously avoided as a part of their training. The impression should be made upon the teachers to withhold physical overwork, in view of their preponderating lowered physique and especially of their liability to cardiac disease, as demonstrated in this contribution. We do not wish to interfere at all with the good hygiene of fresh air and proper direction of active employments.

It can be safely affirmed that America leads in the practical application of these scientific truths which are gradually being formulated for the proper care of the dependent classes.